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# DIRECTIONS FOR OPTIMIZING OF THE ECONOMIC FRAMEWORK AS AN INSTRUMENT FOR REGIONAL DEVELOPMENT

*Modern economic development of the territories requires its comprehensive studies and analysis whereby methods of different sciences. Human geography is one of the most useful for it. In this article, the geographical model of the supporting framework of economy as a constructive tool in regional economic policy is considered. It has a linear-nodal structure and includes key elements of the economic development of the territories, among which are large urban agglomerations (economic nodes and local clusters), economic centers, as well as lines of material and intangible links between the basic elements of the economy. It is suggested that due to its universality and generalization, the economic framework allows determining the main features of the territorial organization of the economy, to indicate its shortcomings and advantages, to outline the points or areas of implementation of large investment projects and so on.*

*On the example of the regions of the Volga Federal district, and in particular the Permskiy krai, the main territorial problems of the development of their economy are demonstrated: hypertrophied by uncharacteristic functions centers (regional capitals), weak regional periphery, lack of sufficient transport, marketing, production and other connectivity between different elements economy for the development of a large domestic consumer market and insufficient representation of modern types of innovative and investment infrastructure. A particular problem of the region's economy is the limited accessibility of some of its territories and the impossibility to build the shortest routes between disparate centers and nodes, which reduces the productivity of labor and the competitiveness of manufactured goods and services.*

*Based on the indication of these problems in the territorial organization of the economy and on the basis of the model of the supporting framework, possible directions for their solution are presented.*

**Keywords**: territorial organization of regional economy, supporting framework of economy, linear-nodal structure, hypertrophied economic node, distribution functions between economic elements, transport connectivity of regional economy.

## Introduction

The transition of regions to self-government and self-sufficiency stimulates the search for ways to improve the efficiency of economic development on the local raw materials base, because the advantages and disadvantages of functioning of regional economy have important consequences in the level and quality of life of the population. The directions of economy's stimulating is seen in the spread of various forms of ownership, technological structures, increasing the independence of the system of intraregional economic ties, the growth of the balance and integrated development of enterprises and their combinations of different size and functional profile. The geographic distribution of economic objects and the results of their activities is of the utmost importance. The basis of the territorial organization of the economy of the Russian regions is ***the supporting economic framework (SEF)***, which is characterized by a linear-nodal structure. Let us consider the possibilities of applying this model in the theoretical and applied

aspects by the example of Permsky krai, one of the old industrial regions of Russia, characterized by a turning point in its economic history

## Theoretical Basis

The beginning of using theoretical construction of supporting framework for research of territorial systems and its elements was laid in the works of Professor of Lomonosov Moscow State University Nikolai Baranskiy (as *the skeleton of the territory*) in 1920th, but continued in the writings of his followers in concept of the supporting frame of the settlement (1960–1980th). Later an idea of the ecological framework of the regions was also formed. In 1990th in human geography and allied sciences (for instance, in geoinformatics and territorial planning) the concepts of framework for transport, touristic and recreational spheres were appeared. Today we can talk about the regional framework of sustainable development, which combines all elements of territorial structure and concentrated all aspects of spatial relations inside the regions. Thus we can observe that framework concepts are quite common in geographical studies. They form the appearance in the theoretical and applied research of the so-called ***framework approach***. Its formation we can trace in the example of Table 1.

Table 1.

**Evolution of formation and dispersion of framework approach in geography**

| Type of frame | Sources of mention | Period (since) |
|---|---|---|
| Framework (“skeleton”) of territory | Nikolay N. Baranskiy [1] | End of 1920th |
| Supporting framework of the settlement | Boris S. Khorev [2], Georgiy M. Lappo, Pyotr M. Polyan [3] | 1960-1980th |
| Ecological framework of the regions | Vladimir S. Preobrazhenskiy [4] | 1980-1990th |
| Transport, touristic and recreational, historical and cultural planning framework | In documents of territorial planning, City-planning code of the Russian Federation [5] | Middle and end of 2000th |
| Regional framework for sustainable development | Nikolay N. Nazarov, Tatiana V. Subbotina, Mikhail D. Sharygin [6] | Middle of 2000th |

Along with the spread of the framework approach in geographic studies, the theoretical ideas about its essence and the possibilities of its application were also changed. Initially, the framework was considered only as a static phenomenon ("skeleton of territory"). According to the theoretical representations it served to describe the territorial pattern of settlement or placement of economic and other regional objects. At present, with the proliferation of system-structural methods, SEF is viewed as a dynamic phenomenon that presents constantly changing transformations in the territorial configuration inside and between the spheres of human life, spatial relations between different objects and areas. Thus, we can note the dual nature of the framework and the presence dialectical properties in this concept: a combination of inertia and dynamism, concentration and dispersion, differentiation and integration, a tendency toward self-development and external regulation, and so on (see Figure 1).

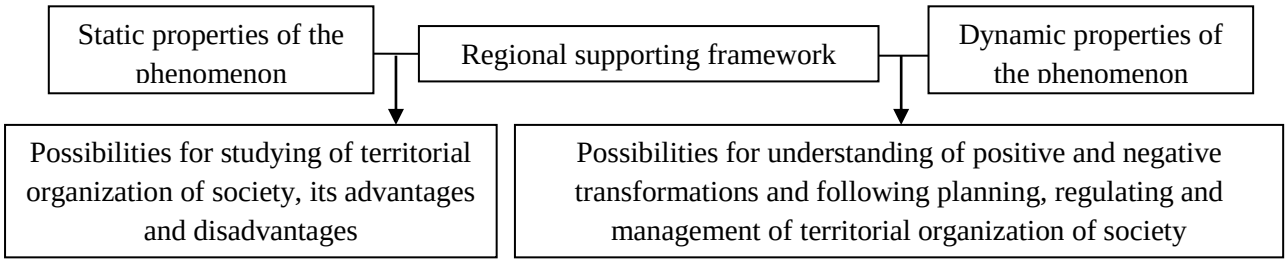



**Fig. 1.** Main aspects of using of framework approach in geographical research

Among different frameworks mentioned in scientific and official literature the supporting frame of the regional economy (SEF) is one of the most important and useful. It is a concentrated invariant of the territorial organization of the economy, a model for the spatial combination of the largest (central, focal) elements of the territorial structure of the regional economy, connected by feeding lines and systems. Thus *the framework has a linear-nodal structure* (see Figure 2*)*. In its composition, it is possible to identify both *point objects* and *linear components*. The most complex elements of SEF are *area ones*. Among the point objects, we can assign an economic centers and nodes, as well as individual objects of production, market, innovative, scientific and technical infrastructure, which have an auxiliary (but more and more defining) importance in recent years. In the group of area objects there are economic areas (agglomerations, territorial complexes, regional clusters) and zones formed in the process of long-term and joint development of various territorial and economic combinations. Linear objects are feeding-distribution highways (general and specialized transport routes, energy and electronic communication lines, telephone communications, etc.), connecting elements of the SEF and ensuring their interaction among themselves [7].

At present, the documents of territorial planning in Russian Federation include the framework of urbanization, transport, tourist-recreational activities and even historical-cultural resources, but there is no mention of the framework of economic development. Meanwhile, the identified and indicated directions on the basis of its modeling can contribute to the optimization (balanced development) of the territorial organization of the economy in many aspects. Let us note some of them on an example of regions of The Volga Federal district and in particular the Permskiy krai.

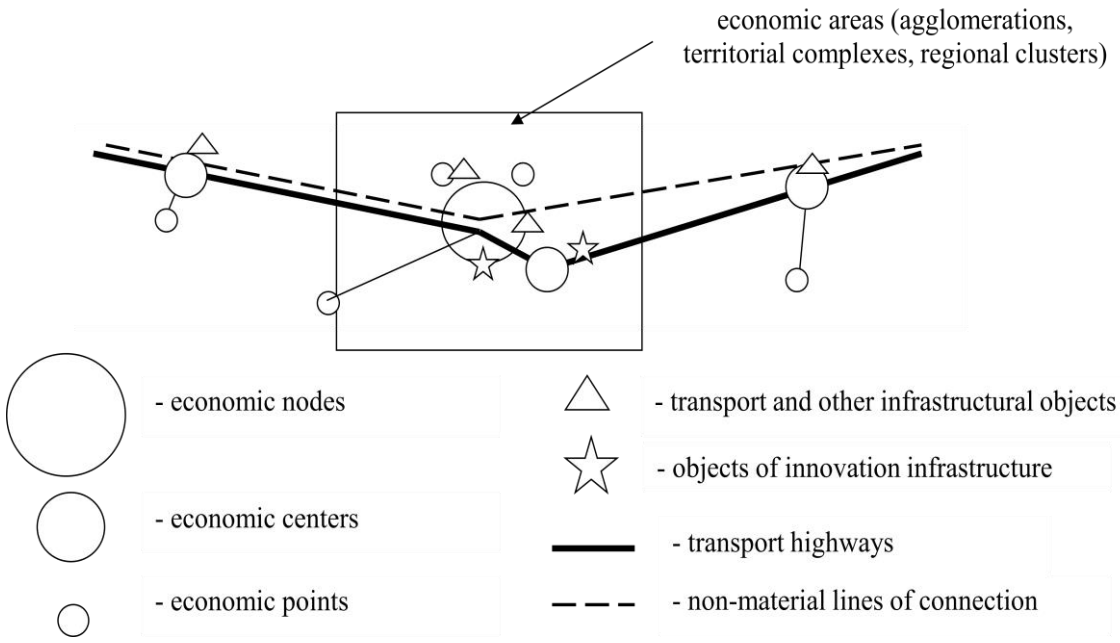



**Fig. 2.** *General scheme of the supporting framework of regional economics [7]*

**1. Using of the model of the supporting framework of the economy can contribute to solving different problems of The Urals-Volga regions, which are characterized by agglomeration-nodal development. It is shown in the dominance of the one economic hub over all the others and deep degradation of economic life at the periphery**.

The data from Table 2 clearly present that in different industrial developed regions of the district regional center is hyperconcentrated by *value of the volume of shipped goods of own production in processing types of industrial activity*. This indicator was not chosen randomly for analysis. It allows you to avoid a possible statistical error, which usually manifests itself in overstating the value of the extracted

natural resources in the headquarter-city of the extracting company instead of the area of their real extraction from the bowels. On the contrary, accounting only of for the profitability processing types of industrial activity makes it possible to assess the closure of the added value of industries in the regional capital and the peculiarities of its redistribution between other cities and territories.

Table 2.

**Dynamics of the share of the Volga federal district's regional capitals in the total value of the value of shipped goods of own production in processing types of industrial activity in 2005-2015,%**

| Regional center | 2005 | 2007 | 2009 | 2010 | 2011 | 2013 | 2015 |
|---|---|---|---|---|---|---|---|
| **Izhevsk** | **57,6** | **60,6** | **46,2** | **45,8** | **48,4** | **48,8** | **50,5** |
| Yoshkar-Ola | 40,3 | 33,4 | 35,2 | 33,7 | 34,2 | 38 | 32,8 |
| Kazan | 20,9 | 17,6 | 23,1 | 21 | 19,5 | 19,9 | 20,9 |
| Kirov | 49 | 51,3 | 45,2 | 46 | 44,7 | 43,7 | 42,7 |
| Nizhniy Novgorod | 33,4 | 30,2 | 21,8 | 22,3 | 22,9 | 29,8 | 29,5 |
| Orenburg | 20 | 16,6 | 18,5 | 17 | 18,1 | 41,3 | 38,7 |
| **Penza** | **64,7** | **68,3** | **67,1** | **66,9** | **64,9** | **64,9** | **48,6** |
| **Perm** | **56,7** | **61,2** | **64,2** | **65,5** | **64,2** | **68,2** | **57** |
| Samara | 24,7 | 26,3 | 30,7 | 28 | 26,8 | 25,2 | 25,8 |
| Saransk | 46,5 | 51,4 | 49,4 | 48,1 | 44 | 43,1 | 44,7 |
| Saratov | 50,1 | 47,7 | 51,5 | 50,2 | 43,3 | 46,6 | 41 |
| **Ufa** | **52,6** | **49** | **58,6** | **58,3** | **57,4** | **67** | **52,7** |
| **Cheboksary** | **61,2** | **65,6** | **66,7** | **65,2** | **50,1** | **59,9** | **52** |
| **Ul'yanovsk** | **58,6** | **64,3** | **72,5** | **75,7** | **69** | **64,3** | **71,1** |
| *Average by years:* | 45,45 | 45,96 | 46,48 | 45,98 | 43,39 | 47,19 | 43,43 |

Source: Database on social and economic development of Russian cities. Retrieved from http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/publications/catalog/doc_1138631758656

The most interesting situation has developed in Ulyanovsk, Penza regions, the Republics of Udmurtia, Bashkortostan, Chuvashia and Permskiy krai. In each of these subjects, the role of "metropolitan" cities in the value of manufactured products in 2005-2015 was more than 50 per cent. In addition, until recent years, the dynamics of this indicator was positive, which meant strengthening the influence of the regional center in the economic complex. A relatively more even distribution of the economic activities of the entities is a characteristic of Samara and Orenburg regions, as well as of the Republic of Tatarstan, where there are two or more established and regulated economic nodes (large industrial agglomerations) recognized to unload the "node" formed around capital (Tolliati, Orsk-Novotroitsk and Nizhnekamks-Naberezhnye Chelny accordingly). They take on a significant part of the region's economic functions, create a competing center in the struggle for resources, people, finances and investment, allow a more even distribution of value added across the region, and do its regional economy is territorially relatively more balanced.

In the phenomenon of contraction of economic resources in the centers of the subjects of the Russian Federation, the so-called capital effect is manifested, which has not been sufficiently studied in the modern geographic and regional economic sciences. Among different research on this theme the works of professors Alexander Druzhinin (Rostov-on-Don) and Natalia Zubarevich (Moscow) are the most outstanding. In particular first of them write: "In the regional political and economic contexts of post-Soviet Russia, the metropolitan areas (*the largest cities*) are rent-oriented (to catch and redistribute mainly resource and positional rents). They are functioning under the dominant economic and political monopolies. The monopoly on power (including the priority disposal of the resource potential of the territory), on institutions creates conditions for the formation of metropolises, the prolongation of territorial social and economic dominance for them, for their stable benefit, for new quantitative and qualitative changes illustrating and supporting its corresponding privileged status" [8, p. 57]. He also notes territorial-social segregation, as one of the main problems arising from the domination of a large city.

In Permskiy krai the situation in the regional economy looks as follows: Perm City within its administrative boundaries concentrated in 2015 57% of the value of region's processing types of industrial activity. The share of the regional capital is also high (2016) in the total population (40%), attracting direct investments in the economic sectors (50%), the total cost of industrial products (including extractive production, production and distribution of electricity) (69%). Its main consequences are the tightening of the region's economic landscape in Perm, the degradation of economic activity on the periphery, the depopulation of territories, a sharp reduction in intra-regional connectivity and opportunities for the development of the domestic market, the closure of value added within a limited number of cities. As a result, the regional capital (Perm City) can be figuratively compared with the islands of extensive growth among the deep periphery. Figure 3 shows the distribution of the value of manufacturing industries between different economic nodes and centers of Permskiy krai. Of course, for the region this is an abnormal situation, which must be corrected in the future.

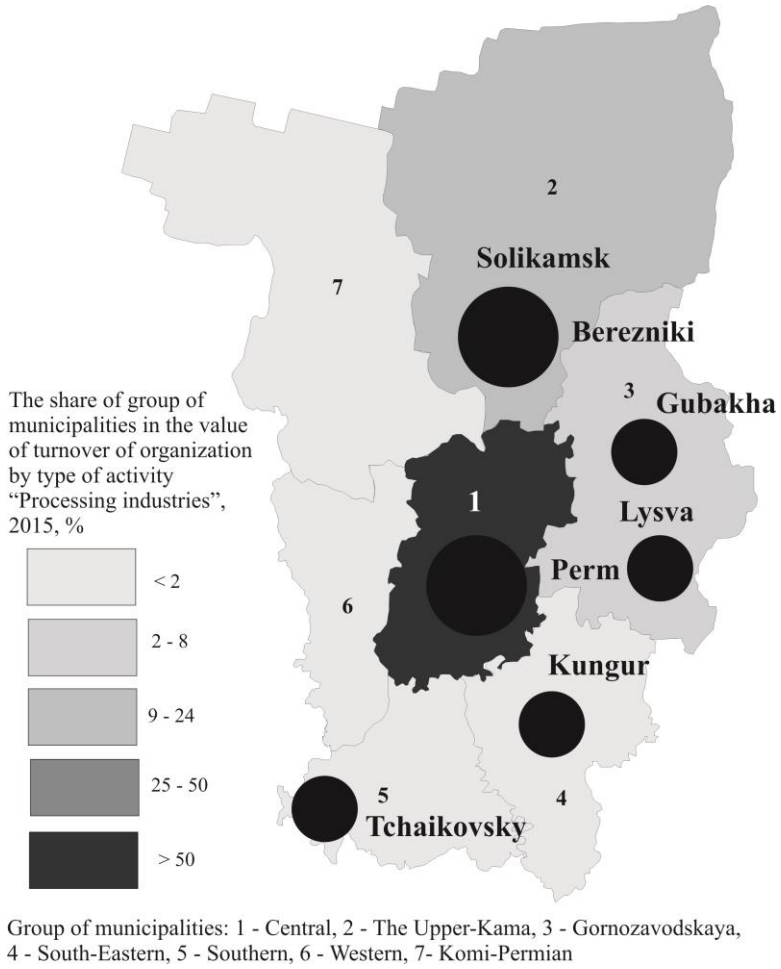



**Fig. 3.** *The distribution of the value of manufacturing industries between groups of municipalities of Permskiy krai, 2015, %*

Source: Database of Indices of Municipalities in Permskiy krai. Retrieved from http://permstat.gks.ru/wps/wcm/connect/rosstat_ts/permstat/ru/municipal_statistics/main_indicators/

At the same time, we should not consider large cities as the source of only problems for territorial development. Different researches clearly show that for the Russian Federation and many other countries with transitional or developing economies, the importance of largest cities cannot be noted. According to cumulative models of the development of economies and territories (in particular, the model of "city-volcano" by H. Hirsh [9], concepts of growth poles by F. Perroux [10] and his followers J.-R. Boudeville, J. R. Lasuen, the diverging effects of G. Myrdal, H. Richardson's agglomeration economy [11], J. Friedmann's theory of center-peripheral relations, etc.) [12], further stimulation of a new type of economy is possible, mainly, in the key territorial elements, which are characterized by the concentration of financial, industrial, scientific and educational resources for the introduction of innovations in regional economy. In this connection it is interesting to refer to Academician A.I. Tatarkin, who pointed out that “the largest cities are the leaders of investment, innovation, social processes, points of economic growth, and the growth rate of the economy of the whole country largely depends on the strategy of their development” [13].

Largest cities have both the potential and the tools for introduction of new economic activities. The opportunities of the largest cities are connected with administrative and agglomeration effects. And if the former is more likely to carry negative consequences, the second one, according to the ideas of Paul R. Krugman [14], acts as a factor of the «second nature» that influences the stimulation of the regional economy. Positive effects of using of agglomeration approach are shown on Figure 4.

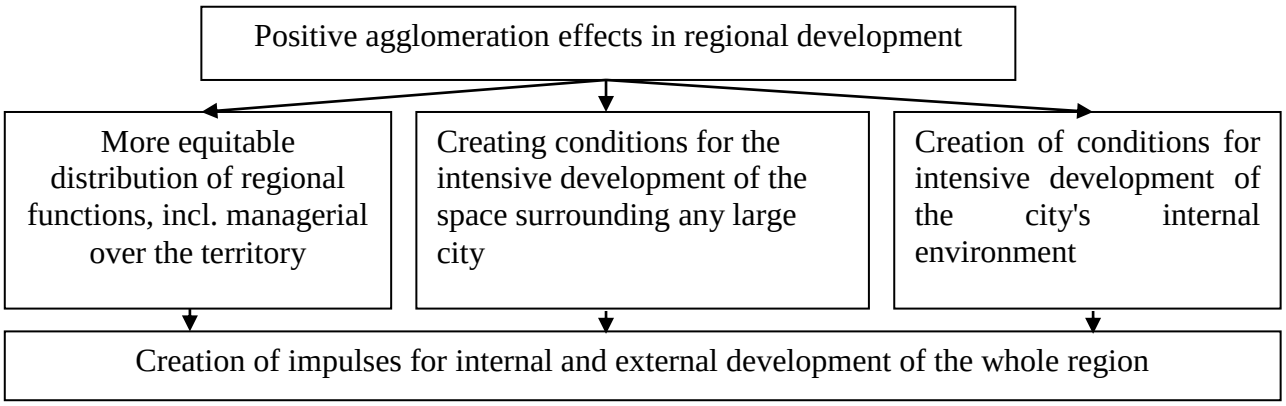



**Fig.4.** *Positive changing under agglomeration effects' using in regional development [15]*

Thus, by correct using of agglomeration effects in regional development (when this using should be "smart" and balanced) we can found the way out of the situation when the largest city receives more advantages than any other sort of settlements. In our opinion, the role of the largest city in regional and national development should be change. For this a balance between the interests of cities on different hierarchal levels in context of new tasks of regional functioning must be found. The processes of self-organization of urban space, the acquisition of excess profits (rents) and additional benefits should not become the main goals of urban policy. In other words, the regional capitals and large cities, which are the main poles of economic activity in the country, attracting and organizing material, human, financial, information flows and forming the skeleton of the territorial organization of modern Russian society (supporting framework of economics and society), must participate in the lives of their subordinate territories, be "responsible" before them, create opportunities for equitable distribution of functions in the regions. As a result of such activities, the apparent centripetal tendencies that have developed in modern Russia should be replaced by bilateral both centripetal and centrifugal tendencies.

Just today in economic framework of Permskiy krai Perm City should be the leader for such new "smart" and balanced development. Its main functions should include uniform organization of the region's space, the creation of incentives for common and own development, ensuring territorial branding, etc. For their realizations there are resources, people, scientific supporting and relatively modern economics (see Figure 5). So, on the territory of regional center the projects of the innovative cluster – the Technopolis "Noviy Zvezdnyi" ("New Star") for the development and production approbation of new engines for space launch vehicles and aviation are being implemented. The IT-, fiber-optic cluster (which is called «Photonics») have developed, a pharmaceutical cluster is being created. Other branches of machine manufacturing and chemical industry have great potential for clustering and increasing of their competitiveness by completing new, upgrading existing and recreating the lost value chains in the realizable technological (energy-related) cycles. First of all it concerns on electrotechnical and oilfield engineering, production of plastics, other synthetic products from hydrocarbons, mechanical processing of wood, development of technologies for processing paper raw materials, development and production of new types of composite materials for construction, human and economic activities.

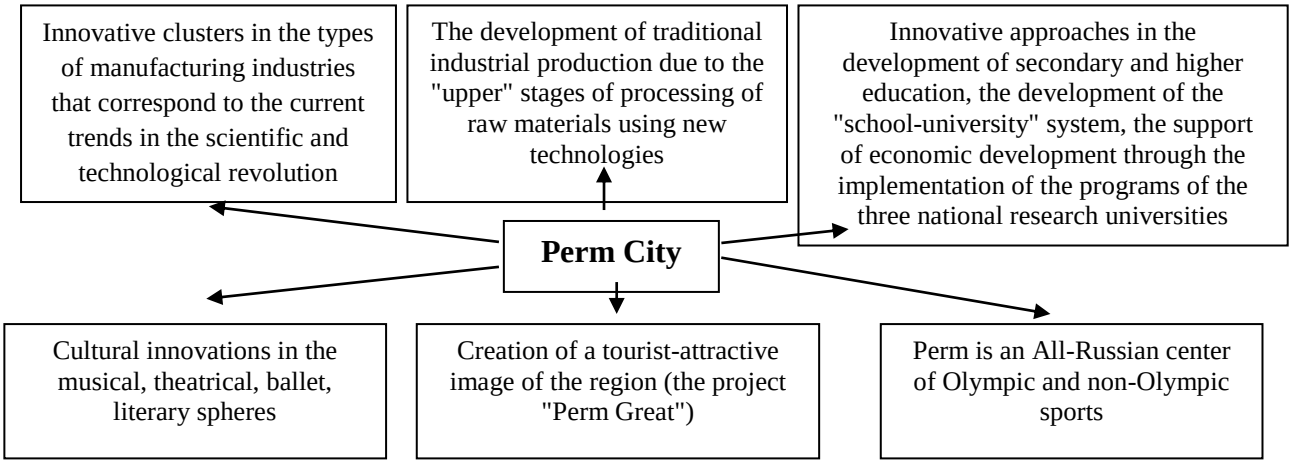
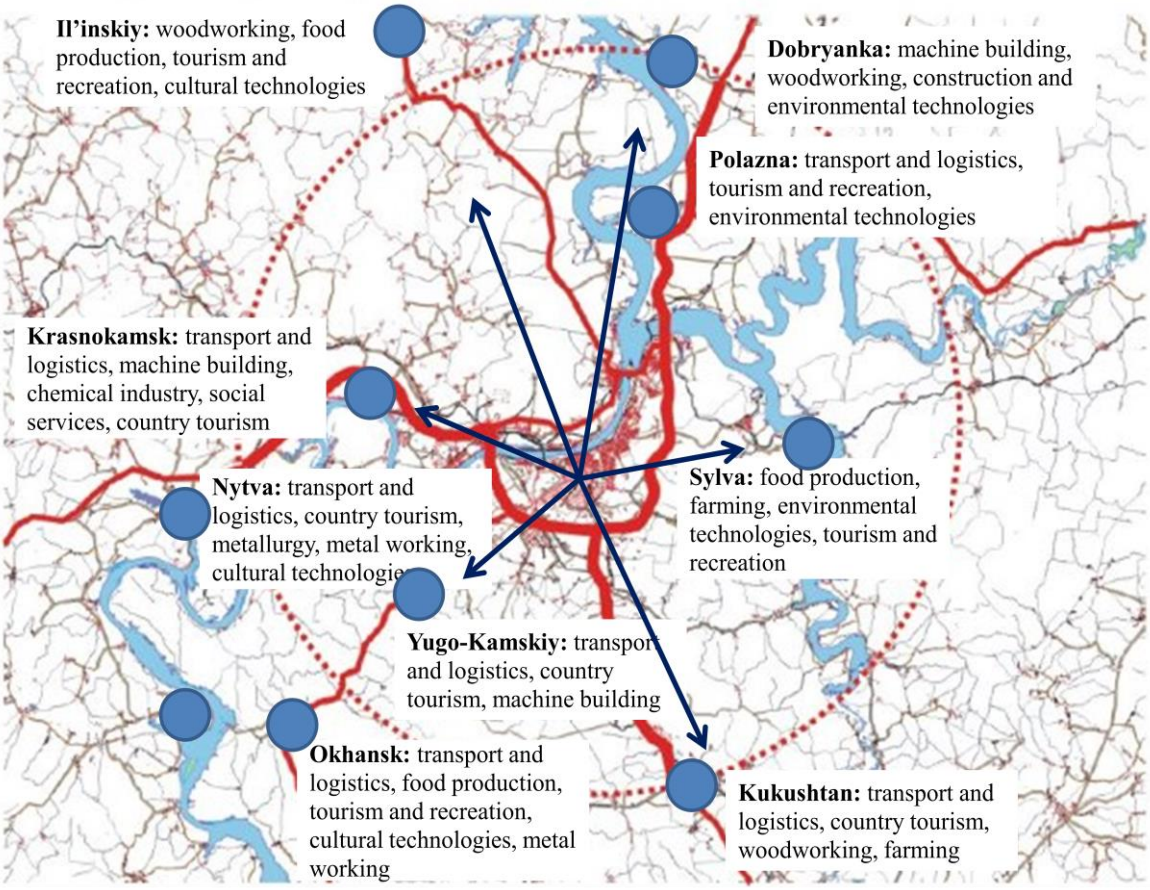



**Fig. 5.** *Modern positive ("smart") functions of Perm City in regional supporting framework of economy*

In addition to positive leadership in the secondary sector of the economy, Perm is already today the Russian leader in the implementation of cultural innovations in music and the theater, ballet art, the activation of the tourist direction of the economy (thanks to the project "Perm Great"), the country's fair movement, the development of secondary and higher education technologies. However, in our opinion, social technologies in health care and insurance medicine, leisure and recreational activities are not yet sufficiently developed in the city. Also the city is inferior in level of development of the urban transport and logistics system. These areas of development should form the basis of urban and regional planning for the near future.

Another area of changings in regional development should be connect with transfer of certain functions of Perm to the settlements of Perm urban agglomeration with the aim of unloading the economy from non-profile activities and restarting them in the sub-centers of the metropolitan area. According to the ideas of geography scientists A.P. Burian and A.M. Korobeynikov [16], a similar or alternative development of the Perm urban agglomeration is based on the processes of deconcentration and decentralization of the socio-economic extensive development of Perm and the accelerated development of small towns and villages on the periphery of the agglomeration, the strengthening of the coherence between its various elements and the integrated realization of the agglomeration's potential.

Among the functions that can be transferred from the regional capital to its immediate surroundings may be named industrial processing (food, woodworking enterprises, enterprises of medium-sized machine manufacturing that do not require skilled labor, etc.), tourist-recreational, cultural-cognitive, transport-logistic, social services for the population, etc. Among the most important subcentres of the agglomeration that can be further developed are the towns of Dobryanka, Krasnokamsk, Okhansk, Nytva, villages Polazna, Il'insky, Yugo-Kamsky, Kukushtan, Sylva and Ural'skiy. The possible distribution of functions between these settlements is shown in Figure 6.




**Fug. 6.** *Sub-centers of Perm urban agglomeration and directions of their stimulation whereby the unloading of the core*

2. **Alignment of the economic landscape should be as a result not only of unloading of hypertrophied nodes of Permskiy krai but also by the help of increasing new functional economic centers of a lower hierarchy level in region**.

The implementation of this direction of improving the framework of the regional economy can be connected with the ideas of the famous Spanish regionalist Jose R. Lasuen [17], who studied the links between urbanization processes and spatial features of the economy. In the classical understanding of his ideas, it can be pointed out that the growth poles (geographic locations with the potential for economic development) need not necessarily be related to the national economy and the export of goods abroad. He notes that the growth pole could be a regional complex of enterprises (rather than branches) located in one of the "geographical concentrations" of the region and associated with its exports, formed due to the growth of nationwide demand. Through market ties (not only through links of between supply and sales), the growth momentum from such a center is transferred to secondary industries and peripheral sectors.

Thus, the growth poles can occupy the middle parts of economic areas and contribute to the distribution of regional income in more evenly. J.R. Lasuen notes: "Development in developed countries is becoming less polarized, due to a more diversified business structure, which leads to a vast spatial spread of innovation and economic development, which means that developing countries can accelerate their growth by creating diversified corporate structures that reduce the severity of polarized strategy" [17].

Following the ideas of the Spanish scientist, we can note that the economic centers located within the regional semi-periphery have potential for innovative growth. The most important task in this direction is the justification of local potential and the search for optimal functions for the new economic centers. Moreover, the search for new or modernization of existing functions is possible, as in traditional types of

activities, which for most semi-peripheral parts of the Ural-Volga regions are industry, and in modern, for instance service activities. **Developing economic centers** using propulsive technologies with infrastructure and management capabilities, benefits of geographical location or other competitive advantages, **can also be the points (focuses) of the growth of territories**.

In our opinion, the following assumptions are relevant for the qualitative development and modernization of the territorial-industrial combinations that have developed in the regional semi-periphery of Permskiy krai:

a) studies of technological chains of value added (in the form of energy and production cycles) [18] in order to improve the main production process and develop auxiliary (including environmental and recycling) technologies;

b) stimulation of industrial production through the development of objects of innovation and investment infrastructure.

In the first direction, we can note that energy and production cycles (EPC, according to the work of professor Nikolay N. Kolosovskiy) is a combination of technological processes that allow you to combine the various stages of production transformation of raw materials and energy. Based on studying and supplementing existing chains, it is possible to anticipate the development of new types of industrial activity (with higher added value), and also to plan the integration of industries for the recycling of industrial waste, as well as inter-branch relations with other types of manufacturing industries. In the concept of EPC geographic, technological, economic, environmental, innovative and other aspects of production activities can be combined. Table 3 shows that it is possible to assume the strengthening of industrial activities corresponding to the current trends in scientific and technological progress based on the EPC deployed in various industrial centers of Perm region, and on the local potential having on the territory.

Table 3.

**Some kinds of energy and productive cycles at industrial centers of Perm region**

| Industrial center | Energy and productive cycles | Kinds of manufactured industries |
|---|---|---|
| Gubakha | Gas-chemical cycle | Production of synthetic resins, plastics, technical spirits and products made of them, nitrogenous compounds |
| | Timber and wood chemical cycle | Hydrolysis of wood with the production of food and technical spirits, wood-fiber boards, dry lumber |
| Kungur | Industrial-agrarian cycle | Manufacture of confectionery products, products from grain products, meat and milk processing |
| | Industrial-building cycle | Products from limestone rocks, incl. wall panels, roofing materials |
| | Group of machine-building cycles | Production of equipment for oil and gas extraction, construction industry, metal processing |
| Lysva | Pyrometallurgical cycle of ferrous metals | Modern types of steel and rolled products, metal products, blanks for machine-building enterprises |
| | Group of machine-building cycles | Electrotechnical engineering, production of equipment for oil and gas extraction, instrument making |
| Tchaikovsky | Group of machine-building cycles | Production of equipment for oil and gas extraction, production of household appliances, instrument making |
| | Gas-chemical cycle | Processing of associated petroleum gas with the production of simple and complex polymers, synthetic fibers and threads, synthetic rubber and |

| | | |
|---|---|---|
| | | rubber products |

Of particular importance is the development of new types of production activities in local EPCs for the towns of Kudymkar, Osa, Vereschagino, Chusovoy and Kizel, which in the past have been reasonably stable industrial centers, and today they have reduced their contribution to the regional economy as a result of the degradation of their industrial complex.

The realization of production functions is also possible through the development of production, engineering, innovation, service and investment infrastructure among them, incl. business incubators, industrial parks, technoparks, local innovative clusters, etc. The choice of places for the infrastructural objects is also an actual task of planning and regulation of the regional economic framework.

Despite the fact that industrial functions still determine the trends (often negative) of the development of the municipal and regional economy of Permskiy krai, it becomes clear that gradual but systematic transformation of economic functions is required in the direction of increasing the importance of service activities. As we indicated earlier, the leader in this direction is the regional capital, but towns and districts of the regional semi-periphery and periphery can also be active in this process. For some of them (Tchaikovsky, Lysva, Gubakha, Kudymkar) already today post-industrial functions are important components of the urban economy, affecting the rebranding of the territory, attracting investments, activating the local community, etc.

We can give some examples of transformations of this kind. Thus, city of Tchaikovsky is a major center of musical culture not only of regional but also of all-Russian significance, which is promoted by the work of the city's theater of drama and comedy, the music school, the holding of the All-russian competition of young composers named after Peter Tchaikovsky, etc. One more postindustrial function of the city is the development of sports and sports infrastructure. On the territory of the village Prikamsky (near the city) there is the Federal Training Center of the Russian Olympic team "Snowflake". Thanks to the work of the complex, Tchaikovsky is already today a well-known center of the sport life of the country, the venue for Russian and international sports forums (summer biathlon championships of Russia and the world, the summer Grand Prix stage for ski jumping, etc.). A more significant role in the future will be played by tourist-recreational (ecological, sport, historical and cultural, etc.) and transport-logistic function (exits from the Western Urals to the Middle Volga region).

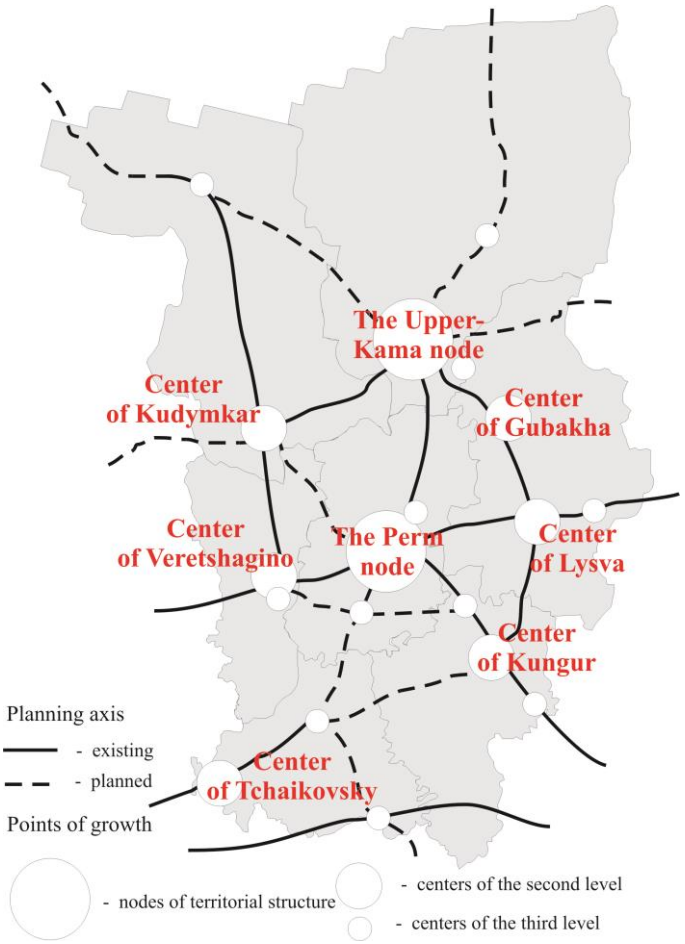



**Fig. 7.** *Perspectives of improvement of supporting framework of economy of Permskiy krai*

The activation of postindustrial activities in Gubakha, located in the east of the region, is based on the interest of the local population in changing the urban interior and landscape. Among the main service functions are tourist-recreational (ski center, fishing, festivals), cultural (theater-studio "Dominanta", touring around the region, participant of various Russian theater festivals; the only Ural museum of coal; interactive activities of the town library, etc.), sports (competitions in sport fishing, ski cross, etc.). Along with the growth of postindustrial activities, the attitude of the residents to their city improves, new objects of urban infrastructure appear (small architectural forms, year-round ice rink, a park of culture and recreation) and appearance of streets and squares is also renewed. So, tourist-recreational, transport-logistical, sports, cultural and educational, financial and other services could become stimulators of economic life in small and medium-sized towns of the Ural-Volga regions.

In general, two indicated directions, provided by the strategic and territorial planning and active participation of the local population in the processes of organizing social and economic activities at the main points of economic development in Permskiy krai can make the regional economy's supporting framework more balanced (see Figure 7). We are convinced that as a result of such changes the territorial organization of the region's economy will be less concentrated in the Perm node, and its incomes will be more accessible to the population living within the periphery.

3. **Transport systems and nets of regions demand modernization in different aspects, especially in their territorial structure**

Transport and logistics' flows optimization is one of the most important direction of economic and social-demographic development within the country [19]. This direction is capable of becoming an instrument for accelerating the innovation process in regional and national economies. This direction assumes the improvement of transport connectivity between economic entities inside the region and

between different regions with the purpose of reducing all kinds of expenses: temporary, spatial, material, financial and etc. [20].

The transport connectivity of economic nodes does not always correlate with the actual flows that are realized in technological, economic, supply-marketing and other connections. On the one hand, the economic framework forms a transport frame, on the other hand the transport frame is the base for of economic framework formation. In a certain period of the region's development, the formation of both skeletons occurs in a relationship and quite synchronously. Then, the economic framework can be transformed without taking into account the optimization aspects in the transport system, or vice versa - the transport framework can develop or degrade, regardless of economic framework transformation (see Figure 8).

The most obvious direction of optimizing the economic framework is to increase the congruence (matching) of existing flows to the existing transport infrastructure. The processes of expansion, rectification, reduction, variation (or alternativization) are an objective necessity of the development of transport and logistics systems.

Co-development of several frameworks occurs asynchronously due to many factors both natural (endogenous) and subjective (exogenous) character. In conditions of unlimited time and resources, all the points in the settlement frame or in the economic framework tend to be connected by shortest paths and several type of transport. But in the context of competitive economy, market relations, limited opportunities and resources, the transport planning takes into account the system of priorities and values.

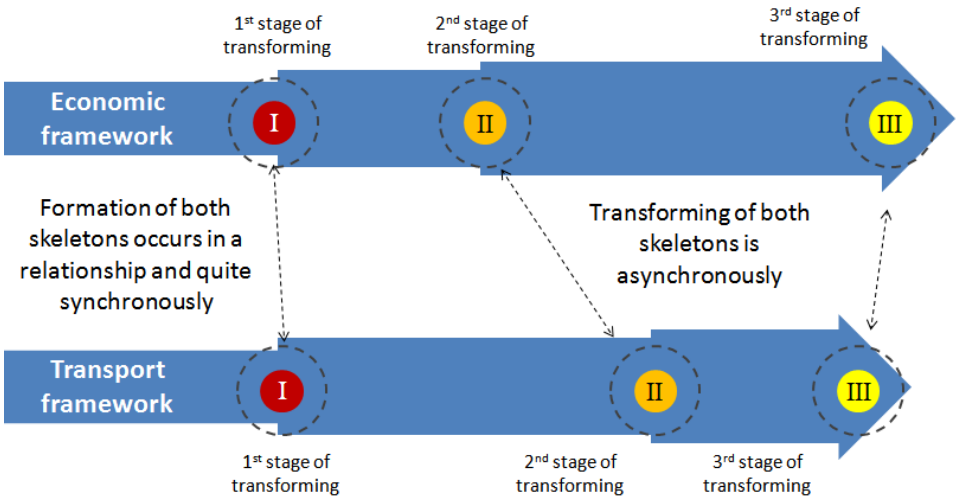



**Fig. 8.** *The formation of transport and economic frameworks*

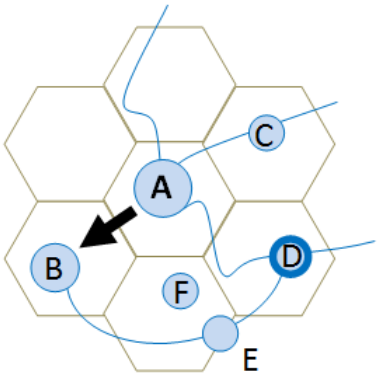
At a certain time, the transport frame expands extensively, embracing more and more new items with its network. Actively interacting points tend to reduce the time distances between themselves, but not in all cases it can be realized quickly. Hydrographic and orographic objects are the most serious obstacles [21]. But if the strength of communication between such points is great, the interaction and the corresponding flows of goods are stable, regular and voluminous, then overcoming such obstacles is only a matter of time.

Gradually the transport communication between such points is improved, straightened, the efficiency of transportation is increased (see Figure 9).

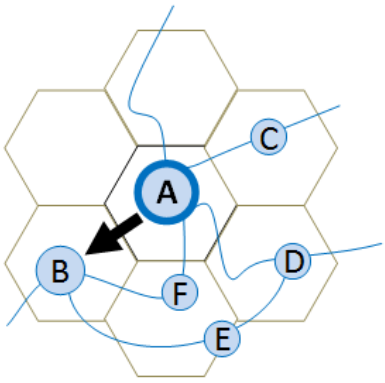
The need for the network covering as many points as possible in the system is an additional factor affecting the configuration of transport land routes. At the same time on transit there is an additional potential for the formation of new industries, which can be a factor in the transformation of the settlement system. But this potential is not always realized.

In an ideal situation, with unlimited resources and time, all points will sooner or later be interconnected by shortest routes, thereby significantly reducing the transport and logistics potential of any nodes, formed due to the configuration of the transport network and (or) the availability of transport

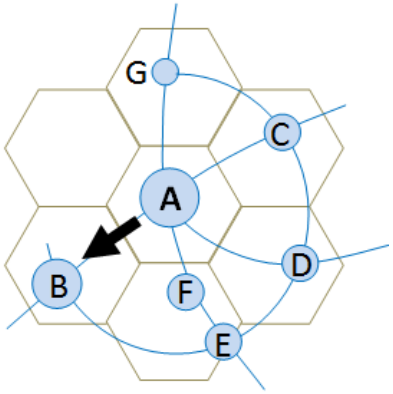
infrastructure. At the same time, some points in the transport system still have a higher logistical potential [22] due to the possibilities of distribution within the system and between systems, which depends exclusively on the features of the settlement system and production and economic activities. It is worth noting that in each type of resettlement there are strengths and weaknesses for logistics. In some settlement systems, conditions for intrasystem logistics are more favorable, in other variants of settlement – on the contrary, competitive conditions are formed for intersystem logistics.



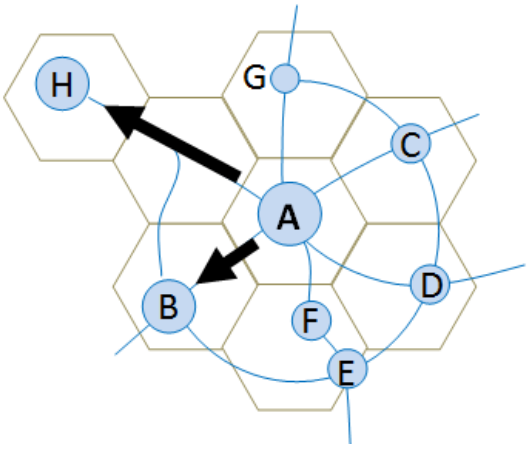

*I. A situation in which two actively interacting centers (A and B) are connected to each other by an indirect communication*



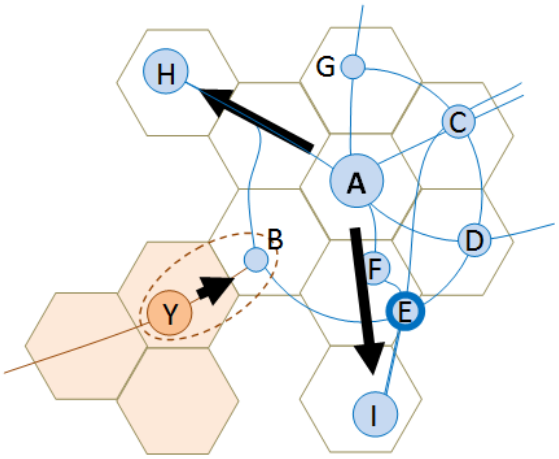

*II. The situation in which all centers are connected by direct communication, but with a high degree of curvature*




*III. The situation in which all centers are connected by direct communication with a minimum degree of curvature*




*IV. The situation in which, despite the presence of a transit flow (between A and B), the formation of a new transport and logistics node on transit does not take place*




*V. The situation in which a large production center (B) loses its importance in the regional system and feels a strong attraction to another regional center (Y), with which it has closer ties. The transformation of industrial-technological relations (I) leads to a transport-logistic restructuring of the system*

**Fig. 9.** *Various scenarios for the formation of transport networks and frameworks*

The change in the spatial organization of the economy and the transformation of production and technological links leads to a change in transport and logistics potentials and creates the conditions for the appearance of new nodes with the functions of accumulation and distribution of flows (see Figure 9).

One of the key indicators of the effectiveness of the transport framework is the degree of curvature of the real route between actively interacting objects within the economic framework. In fact, it reflects the deviation of real routes between points in the transport system from the minimum physical distances between them.

The largest integral degree of curvature along the roads in Perm region is observed for Lysva (1.44), Krasnokamsk (1.41) (Table 4).

The integral index of the curvature by railways reflects the situation of weak connection of railway junctions in the transport system of the Perm region, from which Tchaikovsky is virtually excluded (the degree of curvature is 2.59) (Table 5).

Such deviation may be caused by the need to bypass settlements, physical and geographical objects. As a rule, such deviations insignificantly affect the curvature of the route. A significant index of curvature will be indicative of the fact that there is no direct communication between the points. In this case, with a high level of socio-economic interaction between points, the curvature of the communication between them should tend to a minimum. But not in all cases such a ratio is satisfied, which is a consequence of the lag in the development of one skeleton from the other.

**Table 4.**

**Degree of curvature of the real route from minimal (physical) distance by automobile transport between the 10 largest cities of the Perm region**

| | I | II | III | IV | V | VI | VII | VIII | IX | X | **Integral** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| I. Perm | X | 1,09 | 1,09 | 1,38 | 1,28 | 1,73 | 1,33 | 1,29 | 1,17 | 1,32 | **1,28** |
| II. Berezniki | 1,09 | X | 1,04 | 1,30 | 1,21 | 1,29 | 1,36 | 1,24 | 1,21 | 1,21 | **1,26** |
| III. Solikamsk | 1,09 | 1,04 | X | 1,30 | 1,19 | 1,26 | 1,34 | 1,21 | 1,18 | 1,20 | **1,22** |
| IV. Tchaykovsky | 1,38 | 1,30 | 1,30 | X | 1,47 | 1,49 | 1,24 | 1,38 | 1,38 | 1,23 | **1,36** |
| V. Kungur | 1,28 | 1,21 | 1,19 | 1,47 | X | 1,38 | 1,36 | 1,21 | 1,29 | 1,34 | **1,29** |
| VI. Lysva | 1,73 | 1,29 | 1,26 | 1,49 | 1,38 | X | 1,65 | 1,60 | 1,59 | 1,36 | **1,44** |
| VII. Krasnokamsk | 1,33 | 1,36 | 1,34 | 1,24 | 1,36 | 1,65 | X | 1,34 | 1,81 | 1,50 | **1,41** |
| VIII. Chusovoy | 1,29 | 1,24 | 1,21 | 1,38 | 1,21 | 1,60 | 1,34 | X | 1,32 | 1,29 | **1,30** |
| IX. Dobryanka | 1,17 | 1,21 | 1,18 | 1,38 | 1,29 | 1,59 | 1,81 | 1,32 | X | 1,28 | **1,33** |
| X. Chernushka | 1,32 | 1,21 | 1,20 | 1,23 | 1,34 | 1,36 | 1,50 | 1,29 | 1,28 | X | **1,29** |

One of the most striking examples is the transport incoherence of such large economic centers of the region as Perm and Tchaikovsky. Despite the fact that the points actively cooperate in the chemical, petrochemical, machine-building, food production, there is no direct railway communication between them (see Figure 10). Also, the automobile routes between them are sufficiently curved. Physical-geographical characteristics of the territory, features of the settlement system and administrative boundaries are reflected in the «refraction» of transport routes.

**Table 5.**

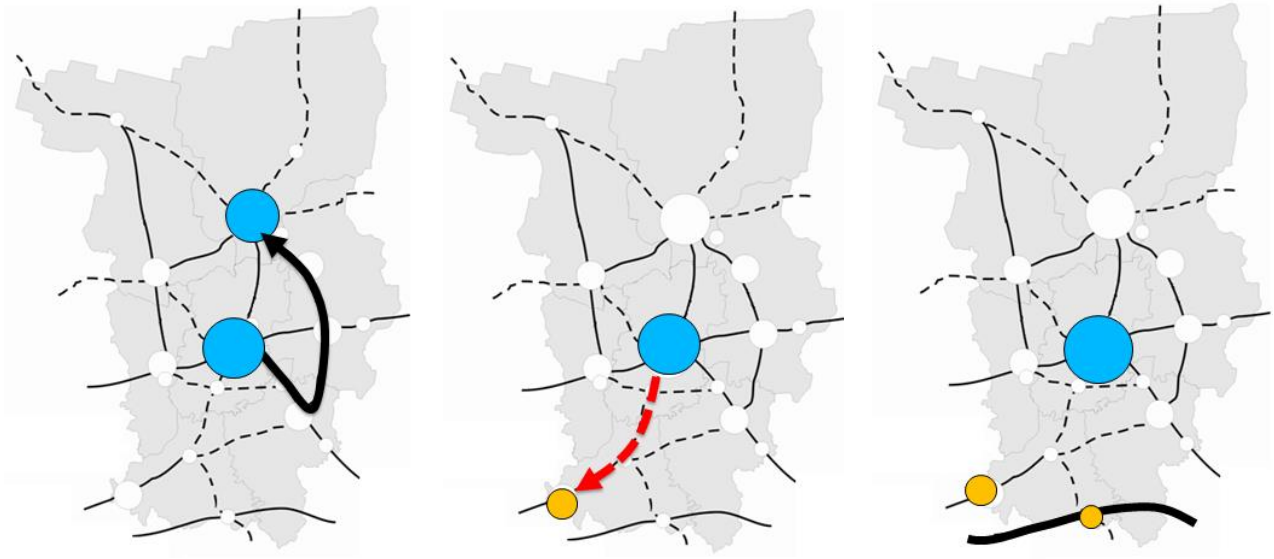
**Degree of curvature of the real route from minimal (physical) distance by rail transport between the main railway nodes of the Perm region**

| | I | II | III | IV | V | VI | **Integral** |
|---|---|---|---|---|---|---|---|
| I. Perm | X | 1,63 | 2,72 | 1,17 | 1,47 | 1,46 | 1,85 |
| II. Berezniki | 1,63 | X | 2,32 | 1,94 | 1,63 | 1,34 | 1,91 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| III. Tchaykovsky | 2,72 | 2,32 | X | 2,68 | 3,37 | 2,34 | 2,59 |
| IV. Vereshagino | 1,17 | 1,94 | 2,68 | X | 1,45 | 1,34 | 1,83 |
| V. Kungur | 1,47 | 1,63 | 3,37 | 1,45 | X | 2,21 | 2,16 |
| VI. Chusovoy | 1,46 | 1,34 | 2,34 | 1,34 | 2,21 | X | 1,86 |

Another example in the Perm region is the long absence of a direct road connection (185 km) between the two key economic centers of the region - Perm and Berezniki. Up until 1996, the car traffic between these two cities passed through Kungur – Lysva – Chusovoy, which increased the route to 400 km – that is more than 2 times (see Figure 10).

Another example, when the development of the transport framework does not lead to the corresponding economic growth - the south of the Perm region. Another example, when the development of the transport framework does not lead to the corresponding economic growth - the south of the Perm region. Despite the fact that a bimodal corridor connecting Moscow, Nizhny Novgorod, Kazan and Yekaterinburg passes through these regions, there are no obvious positive shifts in the economy of Chernushka, Kuyeda and Oktyabrsky (see Figure 10). This is a consequence of the discrepancy between the transport and economic skeletons.



*1. A long time there was no direct connection by road between the main economics nodes in Perm region – Perm and Berezniki. Direct road was create only 1996.*

*2. There are no direct connection by railroad between Perm and Tchaikovsky, despite the fact that the points are actively interacting in the chemical industry.*

*3. On the south of Perm region transport network is sufficiently developed (there is a multimodal line). Despite it serious economic benefits from this is absent.*

**Fig. 10.** *Various examples of asynchronous development of transport and economic frameworks*

The lag in the development of the transport framework from the economic framework can lead to the liquidation of existing industries that emerged under the previous conditions and do not withstand market and competitive conditions. In the Perm region such a situation occurred in Krasnovisherskiy district (liquidation of pulp and paper production) and Komi-Permian district (deconsolidation of wood processing and food production enterprises).

The reverse situation is that when the transport frame is developed, the economic framework is degraded. Thus, the presence of the bimodal meridional corridor Solikamsk-Chusovoy was not a sufficient condition for the formation of new large production facilities in the areas of the former Kizelovsky coal basin.

Another important area of optimization of the transport framework is the unloading of large economic and administrative centers. In the conditions of congestion of some nodes, it is required to create a certain transport-logistic buffer on their periphery in the form of a logistics infrastructure (terminals, centers, complexes). This transport-logistic buffer will allow accumulating and distributing cargo flows in space and time, thus freeing the centers from a number of transport problems.

In the Perm region, due to a certain transport configuration, a large number of forced transit flows pass through Perm [23]. In this connection, in the region it is required to create a logistic buffer for the Perm agglomeration along the Chusovoy – Kungur – Kukushtan – Yugo-Kamsky – Okhansk (a kind of «deep southern bypass» of Perm).

The presented directions of optimization of the economic framework of the territory are not exhaustive. All of them should be considered as an instrument of regional development, aimed at improving the quality and standard of living of the population, primarily with support for sustainable development.

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